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GLOSSARY OF TERMS RELATING TO IRON AND STEEL

PART III HOT-ROLLED STEEL PRODUCTS (EXCLUDING SHEET AND STRIP)

(First Revision)

UDC 669·1-122·4 : 001·4

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GLOSSARY OF TERMS RELATING TO IRON AND STEEL

PART III HOT-ROLLED STEEL PRODUCTS (EXCLUDING SHEET AND STRIP)

(First Revision)

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GLOSSARY OF TERMS RELATING TO IRON AND STEEL

PART III HOT-ROLLED STEEL PRODUCTS (EXCLUDING SHEET AND STRIP)

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part III) (First Revision) was adopted by the Indian Standards Institution on 10 November 1975, after the draft finalized by the Metal Standards Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1962. As a result of experience gained during these years, certain modifications have been made in some of the meanings of the various terms. The Sectional Committee while issuing this revision felt it desirable to issue the standard in separate parts. This part covers terms relating to hot-rolled steel products other than sheet and strip. Other parts of this standard are the following:

Part I	General metallurgy, heat treatment and testing
Part II	Steel making
Part IV	Steel sheet and strip
Part V	Bright steel bar and steel wire
Part VI	Forging (including drop forging)
Part VII	Wrought iron
Part VIII	Steel tubes and pipes

0.3 This standard has been prepared for the guidance of the manufacturers and users to assist them in the uniform interpretation of the common terms used in the iron and steel industry.

1. SCOPE

1.1 This standard (Part III) covers the meanings of the terms commonly used for hot-rolled steel products (excluding sheet and strip).

2. TERMINOLOGY

2.1 Bar — Finished product of solid section which may be rectangular, square, round or half-round or polygonal. The dimensions generally conform to the following:

a) *Rounds and Half-rounds* — Minimum diameter 5 mm.
b) *Squares and Polygonal* — Minimum 6 mm side.

2.1.1 *Flat Bar* (*Flat*) — A finished product, generally of rectangular cross section with edges of controlled contour and of thickness 3 mm and over, width 400 mm and below and supplied in straight lengths. The product shall have rolled edges only (square or slightly rounded). This group also includes flat bars with bulb that has swelling on one or two faces of the same edge and a width of less than 400 mm.

2.2 **Billet** — A semifinished product obtained by forging, rolling or continuous casting, usually square and not exceeding 125 × 125 mm in cross section with rounded corners and is intended for further processing into suitable finished products by forging or re-rolling.

2.3 **Blister** — Local separation of a layer of steel due to accumulated gas causing a protuberance on the surface underneath which is a cavity.

2.4 **Bloom** — A semifinished forged, rolled or continuously cast product intended for re-rolling or forging. The cross section is square or nearly rectangular (excluding slab) and the cross section is generally more than 125 × 125 mm (or equivalent cross-sectional area).

2.5 **Broken Corners** — Wide but usually short cracks across the edges of semifinished products (such as blooms, billets and slabs).

2.6 **Burnt Edges** — Broken edges occurring during hot-rolling, caused by overheating or burning (*see also* **2.19**).

2.7 **Burr** — The sharp fringe of metal left on a sheared or saw cut bottom edge (*see also* **2.28**).

2.8 **Camber** — The curvature observed in long rolled products caused by differential cooling or faulty setting of the rolls. It is measured by the maximum deviation of the middle region from the straight line joining the ends.

2.9 **Cast (Heat or Melt)** — Usually the product of a single furnace charge. Sometimes the furnace contents are tapped into two or more ladles when the product of each ladle may be called a separate cast.

2.10 **Checked Edges** — Cracked edges in sheet bars and strips occurring during hot-rolling.

2.11 **Chill Cracks (Fire Cracks)** — Marks on a rolled surface resulting from cracks in the surface of a roll used for hot-rolling. A particular form of roll mark, surface cracks, found on rolls is usually caused by alternate heating and cooling or by the overheating of the rolls in service in which case it is called fire crack.

2.12 **Chipping** — Removing surface defects by manual or pneumatic chisel.

2.13 Clad Steel — A composite material of a carbon or alloy steel with a surface layer of another steel, metal or alloy, firmly bonded together.

2.14 Clink — A crack either internal or external caused by uneven contraction or expansion during heating or cooling of steel.

2.15 Cogging (Roughing) — The action of reducing by hot-working of an ingot to blooms or slabs for subsequent rolling or forging.

2.16 Coiled Bar — A long length of hot-rolled bar produced in a continuous rolling mill and coiled in a manner similar to a wire rod.

2.17 Coiling — The process of laying or winding the product (usually wire rods and wires) in the form of coils.

2.18 Controlled Coiling — Coiling from the final hot-forming (rolling, forging, etc) or heat treatment operation in a predetermined pattern to control camber, prevent flaking, reduce scaling, improve properties, etc.

2.19 Cracked Edges — Cracks across the edges (that is, at right angles to the direction of rolling) of rolled products. The term broken corners is used in connection with large sections, for example, blooms, billets and slabs (*see also* **2.6**).

2.20 Cropping — Shearing off discard from the ends of an ingot or bloom or forged products prior to further working. End discard shearing of semifinished or finished products is also called cropping (*see also* **2.25**).

2.21 Cross Rolling -- Rolling in the direction transverse to the longitudinal axis of the ingot or slab, as in the production of plate or sheet.

2.22 Decarburization — Loss of carbon from the surface of steel, usually during heating, hot-working or heat treatment (*see* Fig. 1).

2.23 Descaling — Removal of surface scale from a hot-worked or heat-treated product by pickling, shot-blasting, etc. Also removal of scale during hot-working by the application of water, coal dust, brushwood, oil, etc.

2.24 Deseaming (Scarfing) — The removal of surface defects from ingots or semifinished products by an oxy-gas flame.

2.25 Discard — Those portions, corresponding to the top and bottom of the ingot, which are removed to ensure that the remainder of the material is of satisfactory quality. Also defective material produced in rolling or forging, to be cut from one or both ends of the semifinished or finished product (*see also* **2.20**).

2.26 Dressing — Removing surface defects of an ingot, bloom or slab by chipping, deseaming or other methods.

2.27 Edging — The application of rolls to the edges of a rectangular section, for example, slab, plate, strip and flat, with the object of controlling width and giving a smooth edge during the rolling process.

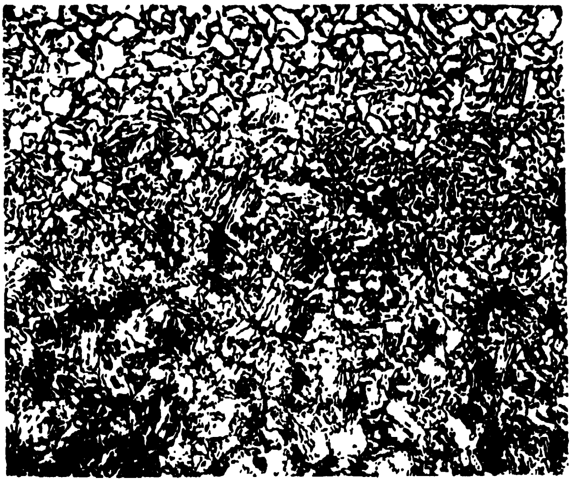


FIG. 1 DECARBURIZED SURFACE LAYER OF STEEL SPECIMEN

2.28 Fash (Burr, Flash) — Sharp and jagged edges left after shearing or sawing (*see also* **2.7**).

2.29 Fin (Overfill, Flash) — A protruding rib of metal running longitudinally along a rolled product, as results from overfilling a pass.

2.30 Finished Products — Rolled or forged products whose transformation in an iron and steel plant is completed. Their cross section is uniform and is often defined by a standard which fixes the ranges of nominal dimensions as well as the tolerance of form and dimensions. The outline of the cross section and the surface finish is such that quite often the user has only to cut to the required dimensions.

2.31 Finishing — The later stages of a rolling process wherein the material is brought to the desired shape and dimensions. It also refers to the process of cutting to length, drilling, machining, straightening, dressing, oiling, etc, of the finished products.

2.32 Finishing Temperature — The temperature at which hot-working is completed.

2.33 Fish Tail — The V-shaped cavity which may develop at the end of the piece during hot-rolling.

2.34 Goethic Section — A rolled or forged product having approximately square section. The dimensions are specific with specified radius or chamfer at corners without any concavity on the sides.

2.35 Guide Mark (Guide Scratch, Guide Score, Guide Shearing) — A surface defect resulting from abrasion between the steel/iron and a guide used for ensuring location in rolling.

2.36 Hair Line Cracks (Hair Cracks) — Internal ruptures in steel caused by stresses which probably arise from the combination of several factors, such as volume changes due to transformation, brittleness due to the presence of hydrogen, and the arrangement of the microstructure, resulting from hot-working. The size of such ruptures may vary considerably, but they are usually comparatively short in length when viewed on a surface cut at right angles to the plane of defect, and generally are so fine that they cannot be discerned other than after etching or by magnetic crack detection.

2.36.1 *Snowflakes* — When hairline cracks are exposed by fracturing, they appear as bright crystalline areas of almost circular form, sometimes known as snowflakes.

2.37 Heat Waste (Fire Waste) — The loss of material by scaling in a reheating or hot-working process.

2.38 Hot Bed — A cooling bank for accommodating hot-rolled products to minimize distortion during subsequent cooling.

2.39 HR Coil — A hot-rolled flat product supplied in coil form.

2.40 Inclusions (Non-metallic Inclusions) — Particles of oxides, silicates, sulphides, refractories, etc, embedded in the metal. These are products of deoxidation.

2.41 Ingot — Cast product of suitable shape and size intended for subsequent hot-working.

2.42 Ingotism — The extremely coarse dendritic structure which exists in unannealed ingots and castings. It is a term which is also used to describe microstructure of forgings which show coarse dendritic pattern. Pattern of ingot structure is observed in sulphur prints of blooms and billets.

2.43 Inverse Segregation — *See* **2.71**.

2.44 Laminations — A defect in rolled materials, characterized by a tendency to split into layers along the direction of rolling usually due to the presence of non-metallic inclusions or other discontinuity in the steel.

2.45 Lap (Overlap, Shut) — A surface defect caused by the folding of a surface against itself.

2.46 Mangling — Flattening of plates, hot or cold, by passing through a multi-roll straightening machine.

2.47 Overheating — Heating to such a high temperature that an undesirable coarse grained structure is produced. Severe overheating may result in the properties being permanently impaired.

2.48 Over-Pickled — Pickled longer than necessary resulting in pronounced chemical attack causing pitting and roughness on the surface.

2.49 Phosphide Streak — An elongated area of segregated phosphides which is revealed on etching.

2.50 Pickling — The removal of scale by chemical or electrochemical treatment with diluted acids or other chemicals followed by washing.

2.51 Pipe (Contraction Cavity, Shrinkage Cavity) — An axial cavity caused by contraction during solidification of an ingot. Also the defect arising from the axial cavity in semifinished or finished products. It may also refer to tubular products.

2.52 Pitted Surface — A surface containing small cavities resulting from unsatisfactory processing.

2.53 Planishing — Improving the surface by the action of chill cast or hardened steel rolls or by hammering with smooth faced hammer.

2.54 Plate — A hot- or cold-rolled flat product, rolled from an ingot or slab, in rectangular cross section of thickness 5 mm and above and width 600 mm and above, and supplied in straight lengths.

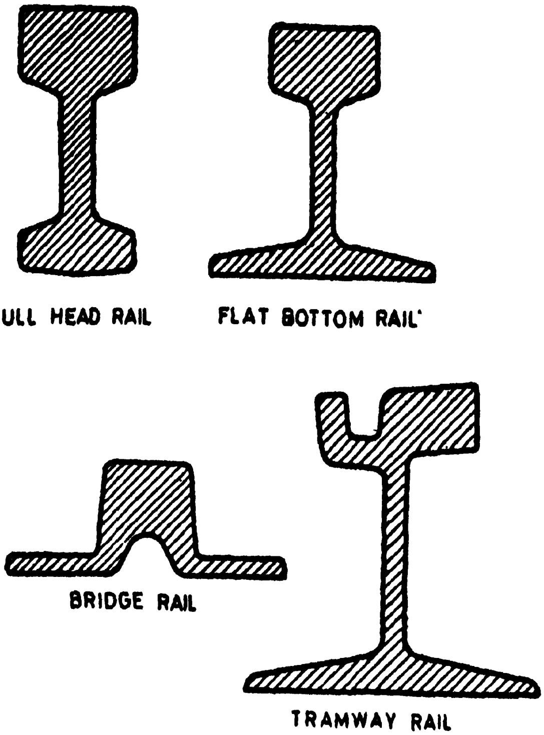
2.55 Pull — An irregular transverse crack on the face of an ingot caused by restriction to free contraction during cooling in the mould.

2.56 Ragging - A series of grooves usually horizontal, made in the surface of a roll in order to assist the roll to bite the steel and to prevent skidding between the roll and the work. Ragging is usually found in roughing and forming passes.

2.57 Rail — The purpose of steel rails is to form a continuous runway or track which has sufficient strength for carrying required moving wheel loads. Rails are now designed with a head for the wheel treads and for guiding the wheel flanges, a web for girder strength and fastening the rail to its support. A proper proportioning of the head, web and base in section design is an important consideration in the manufacture of rails as well as in their efficient utility. General varieties of rails in use are shown in Fig. 2.

2.58 Reed — An internal discontinuity originating from a subcutaneous blow-hole which has become oxidized and has been elongated during rolling.

2.59 Reeling — Straightening (and planishing) a round bar by feeding it between contoured steel rolls in a direction approximately parallel to the principal axes of the rolls.



BULL HEAD RAIL FLAT BOTTOM RAIL

BRIDGE RAIL

TRAMWAY RAIL

FIG. 2 COMMON SECTIONS OF RAILS

2.60 Reheating — Heating steel to a uniform temperature in readiness for hot-working.

2.61 Rod Crack — A longitudinal defect in wire rod or wire due to unsatisfactory rolling technique.

2.62 Rod (Wire Rod) — Wire rod is generally square, round, half-round, rectangular or polygonal and between 5 to 20 mm in diameter, and is intended for conversion into wire.

2.63 Roke (Roak) — A longitudinal surface defect (an elongated fissure) caused by a blow hole which is not welded up during rolling and has perforated the surface and become oxidized.

2.64 Rolled-in-Scale — Local areas of scale pressed into the surface of the stock during rolling.

2.65 Roller Straightening — A process involving a series of staggered rolls usually of small diameter between which rods, tubes, etc, are passed for the purpose of straightening. The process consists of a series of bending operations.

2.66 Rolling — The shaping of the metal by passing it between two rotating rolls.

2.67 Roll Marks — Periodic surface defects due to some imperfection on the surface of a roll.

2.68 Roll Pass (Pass) — Openings of definite shapes formed between a set of rolls through which hot steel passes for taking up the given shape or undergoing a desired amount of reduction in sectional area. This term also applies to a single passage through a pair of rolls for the purpose of altering the shape and/or reducing the cross-sectional area.

2.69 Seam — Long shallow grooves or striations formed during working by the elongation of oxidized surface or subsurface blow-holes. Seams may also be caused by rippled surfaces or by recurrent teeming laps.

2.70 Section, Structural — A hot-rolled product widely used for structural purposes, with a cross section of special contour. The common types are as shown in Fig. 3.

2.71 Segregation — A non-uniform distribution of some constituents and/or impurities, in a cost product characterized by the mode of solidification of alloys. Segregation usually persists through subsequent hot and cold working. Generally, the concentration of low melting constituents tend to be higher in the centre than the surface. Sometimes, the reverse of this phenomenon takes place and is known as inverse segregation (*see also* **2.43**).

2.72 Semifinished Products — Continuously cast products and products generally obtained by forging or rolling ingots and intended for transformation into finished products. The cross section is generally square, rectangular with angles more or less rounded; the section has uniform dimension all along the length of the piece. The tolerances are generally wider than those for finished products. The surfaces can be partially or totally conditioned by scarfing, chipping, grinding, planing or milling and turning.

2.73 Sheet Bar (Slab Bars) — Semifinished products of rectangular section, of a thickness not less than 6 mm, width not less than 150 mm and of such dimensions that the thickness does not exceed one quarter of the width. This term also includes the product tinplate bars.

2.74 Sheet Slab — A slab of suitable size for rolling into sheet.

2.75 Shell (Scab, Sliver, Spill) — A relatively thin film or torque of metal imperfectly attached to the surface of steel. The defect on the sides of the ingot caused by metal splashes during teeming, having solidified and stuck to the mould wall is also called shell or splash.

2.76 Slab — A semifinished rolled, forged or continuously cast product

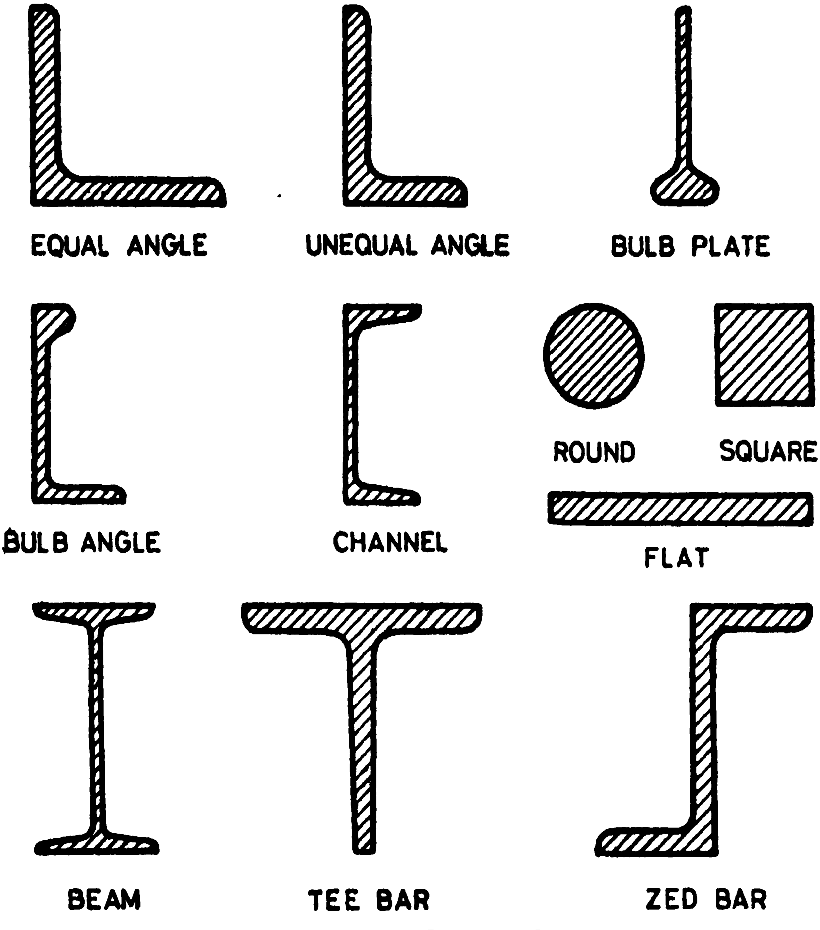


FIG. 3 COMMON SECTIONS USED FOR STRUCTURAL PURPOSES

intended for re-rolling or forging. The cross section is rectangular. The thickness does not exceed one third of the width.

2.77 Tin Bar — A type of bar suitable for rolling tin plate (*see* **2.73**).

2.78 Tolerance (Rolling Margin) — The permitted deviation from a specified dimension or weight usually expressed as plus or minus on that quantity.

2.79 Tramlines — An overfill or lap usually occurring in parallel pairs of line. Long straight marks due to drawn out inclusions on rolled sheet are also called tramlines.

2.80 Underfill — A cross section which has not filled up the roll pass, so that it is inaccurate in both shape and dimensions.

2.81 Universal Plate — Finished product hot-rolled on four faces (or in closed channels) distinguishing them from plates. The width is greater than 150 mm but not greater than 1 250 mm, their thickness is 5 mm or more.

2.82 Universal Rolling — Rolling in an universal mill provided with edging rolls for obtaining closer width tolerance and better edges in plates and slabs.

2.83 Wash Heating (Sweating) — The soaking of an ingot or part cogged ingot (after limited rolling) at high temperature under oxidizing conditions so that surface melts and runs off as fluid slag. Surface defects of an ingot or partly cogged ingot may be removed in this way.

INDIAN STANDARDS

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METALS

IS:

SP:2-1968 Comparison of Indian and overseas basic sizes for sheet and wire
1136-1958 Preferred sizes for wrought metal products
1137-1959 Thicknesses of sheet and diameters of wire
1387-1967 General requirements for the supply of metallurgical materials (*first revision*)
1762 (Part I)-1974 Code for designation of steel, Part I Based on letter symbols
1956 Glossary of terms relating to iron and steel
  (Part I)-1976 General metallurgy, heat treatment, and testing
  (Part II)-1976 Steel making
  (Part III)-1975 Hot-rolled steel products (excluding sheet and strip)
  (Part IV)-1975 Steel sheet and strip
  (Part V)-1975 Bright steel bar and steel wire
  (Part VI)-1976 Forging (including drop forging)
  (Part VII)-1976 Wrought iron
  (Part VIII)-1976 Steel tubes and pipes
2049-1963 Colour code for the identification of wrought steels for general engineering purposes
2066-1962 Coding and classification for non-ferrous scrap metals and residues
2084-1974 Code for designation of pig iron (*first revision*)
2085-1962 Code for designation of ferro-alloys
2376-1963 Colour code for the identification of copper and copper alloys
2378-1974 Code for designation of copper and copper alloys (*first revision*)
2379-1963 Colour code for the identification of pipelines
2479-1969 Colour code for the identification of aluminium and aluminium alloys for general engineering purposes (*first revision*)
2549-1963 Code for classification of processed ferrous scrap
2763-1964 Glossary of terms relating to foundry technology
4843-1968 Code for designation of ferrous castings
7598-1974 Classification of steels

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Printed at Sree Saraswaty Press Ltd. Calcutta 700 009, India

AMENDMENT NO. 1 SEPTEMBER 1976
TO
IS:1956(Part III)-1975 GLOSSARY OF TERMS RELATING TO IRON AND STEEL
PART III HOT-ROLLED STEEL PRODUCTS (EXCLUDING SHEET AND STRIP)

(First Revision)

Addendum

(Page 9, clause 2.62, line 2) - Insert the word 'usually' between the words 'and' and 'between'.

(SMDC 1)

Reprography Unit, ISI, New Delhi

AMENDMENT NO. 2 SEPTEMBER 1987

TO

IS:1956(Part 3)-1975 GLOSSARY OF TERMS RELATING TO IRON AND STEEL

PART 3 HOT-ROLLED STEEL PRODUCTS (EXCLUDING SHEET AND STRIP)

(First Revision)

(*Page* 3, *clause* 2.1, *first sentence*) - Substitute the following for the existing first sentence:

'2.1 *Bar* - Finished product of solid section generally supplied in straight length, which may be rectangular, square, round or half round, or polygonal.'

(*Page* 9, *clause* 2.62) - Substitute the following for the existing clause:

'2.62 *Wire Rod* - It is generally square, round, half round, rectangular, or polygonal, hot rolled product in the coiled form. It is generally intended for conversion into wire.'

(SMDC 1)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 3 MARCH 1989
TO
IS : 1956 (Part 3) - 1975 GLOSSARY OF TERMS RELATING TO IRON AND STEEL
PART 3 HOT-ROLLED STEEL PRODUCTS (EXCLUDING SHEET AND STRIP)
(First Revision)

[*Page* 3 *clause* 2.1 (*see also Amendment No.* 2)] — Substitute the following for the existing clause:

'**2.1 Bar and Rod** — Finished product of solid section generally supplied in straight length, which may be rectangular, square, round or half round, or polygonal. The bars may be supplied in coil form also. The dimensions generally conform to the following:

a) *Rounds and Half-Rounds* — Minimum diameter 5 mm.

b) *Squares and Polygonals* — Minimum 6 mm side.'

(SMDC 1)

Printed at Printwell Printers, Delhi, India